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CARLTON BANK
NORTH YORKSHIRE
Phase III
Archaeological Survey

Interim Report

Commissioned by: North Yorkshire Moors National Park

Carlton Bank
North Yorkshire
Archaeological Survey

Interim Report

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SUMMARY

Lancaster University Archaeological Unit (LUAU) is presently undertaking a third phase of archaeological recording at Carlton Bank alum works (NZ 520 027), Carlton, North Yorkshire. An archaeological survey followed by mitigation excavation have been undertaken on behalf of the North York Moors National Park, in advance of a proposed reclamation scheme. The results of the survey only are presented within this interim report.

The site consists of a large quarry, with extensive tips of calcined shale on the hillside below its mouth. It is known from historical evidence that the alum works operated from the 1680s to 1774, and that much of the processing took place at an 'alum house' on the low ground below, c 1km to the north-west of the quarry (and outside the study area). However, some basic processing was also undertaken at the platform area above the spoil heaps.

The topographic survey revealed three potentially significant archaeological features (sites 3, 4 and 5) which appear to relate to the water management of the site. The main area of processing was subsequently discovered, during the mitigation excavation, to be deeply stratified and therefore for the most part was not evident on the surface. However, there is one notable exception: Site 2 is a large circular hollow which was found to be directly over a stone-lined silo, revealed by the excavation. The hollow appears to reflect the subsidence or collapse of the underlying structure.

The value of the survey is primarily that it has recorded the spoil mounds and some associated water management features, although the depth of overburden meant that was not significantly able to inform the processing function of the site. It has, though, highlighted the severity of the damage that has been caused to the archaeological remains by the continuing erosion of the site (Site 1).

ACKNOWLEDGEMENTS

We are grateful to the North York Moors National Park for commissioning and funding the project, and to Graham Lee (National Park Archaeologist) for his help. We are also grateful to Mr Saddington (landowner of the site) for his co-operation.

The topographic survey at Carlton Bank was carried out by Nick Hair and Chris Wild, the report being drafted by Chris Wild.

The project was managed, and the interim report edited, by Jamie Quartermaine.

1. INTRODUCTION

1.1 INTRODUCTION

- 1.1.1 The Lancaster University Archaeological Unit (LUAU) has conducted a third programme of archaeological evaluation and recording at Carlton Bank alum works, within the North York Moors National Park (NYMNP). The project was undertaken in accordance with a brief specified by Graham Lee (National Park Archaeologist).
- 1.1.2 The alum works at Carlton Bank, North Yorkshire, survive as a large quarry, with associated features which may be a legacy of the calcining and initial steeping of the alum shale, together with a large spoil tip, over the scarp slope at the north-westernmost point of the Cleveland hills. The spoil tip has become increasingly unstable and subject to slumping in the last few years; therefore the decision has been taken by the North York Moors National Park that stabilisation work should be undertaken, necessitating the removal of almost all of the spoil tip.

1.2 SITE DESCRIPTION

- 1.2.1 The site (NZ 520 027) lies on the north-facing scarp of the North York Moors, an area of Jurassic rocks dipping very gently to the south. The crest of the scarp is formed by Lower Deltaic Sandstone, beneath which lies a considerable thickness of 'Alum Shales'. These in turn overlie the thin Dogger limestone, over further shales containing a seam of jet. The alum quarry is cut into the steep scarp face from the north, within the Alum Shales, and extends south to the edge of the Lower Deltaic Sandstone, with shallower lobes extending south-east and south-west below the strike of this outcrop. The outcrop of a jet seam, just below the floor level of the quarry, is marked by a horizontal line of workings along the hillside.
- 1.2.2 The crest of the scarp lies at *c* 400m OD, and the base at *c* 200m OD; the floor of the main quarry lies at 320m OD. The vegetation cover consists of heather moorland on the flatter areas, giving way to rough grass on the steeper slopes, with bracken and some scrub towards the base of the scarp. There is extensive bare ground on the sides of the quarry (due to the unstable and steep surface of weathered shale) and on the tips to the north of the quarry (due to the instability of weathered shale), coupled with the acid and infertile nature of the calcined shale of which these tips are composed. The tips and the slope below them have been affected by landslipping.

1.3 BACKGROUND HISTORY

- 1.3.1 Alum working in the area began in earnest in the seventeenth century. Alum shale was extracted by quarrying, often on a very large scale in comparison to other industries during the early post-medieval period. The broken shale was then calcined (roasted) in large heaps ('clamps'), mixed with a small amount of

brushwood and/or coal; the clamps sometimes had permanent clay bases containing flues. Calcining took several months, and consisted of a slow burning to oxidise the pyrites to iron sulphate, which in turn reacted with the shale to form aluminium sulphate and iron oxide.

- 1.3.2 The aluminium sulphate, being soluble, was then leached out of the shale in a series of 'steeping tanks', lined with clay, stone, wood, or lead. Calcined shale was placed in these tanks, water added, and the mixture stirred and allowed to settle. A series of tanks was used to produce a progressively stronger solution. The leached shale, still a distinctive red colour, was then dumped. All these processes took place within or very close to the quarry, due to the bulk of shale involved.
- 1.3.3 The 'raw' alum liquor produced was led into storage cisterns near the steeping tanks, and then fed by a culvert or 'liquor trough' to an 'alum house' where it was purified, converted into alum by the addition of potash or ammonia, and crystallised. Since these processes used large amounts of fuel, and relatively small amounts of alum (which was in liquid form), the alum house was usually sited downhill from the quarry, where transport of fuel and other imported materials was easier.
- 1.3.4 Until the sixteenth century, alum for use in Britain was imported from the Mediterranean, where a Papal monopoly existed. Sixteenth century attempts to develop home production, largely in southern England, were unsuccessful.
- 1.3.5 Technical success was achieved at the start of the seventeenth century, in the Guisborough area, under a Crown monopoly. By the middle of the century the industry was commercially viable, and it was returned to private ownership in 1679; many new works (including Carlton Bank) were opened, though most of these were short-lived. The British industry was concentrated almost exclusively on the North York Moors.
- 1.3.6 Following a slump in the 1770s, many works closed and production was concentrated in the few surviving works, still in North Yorkshire. In the mid-nineteenth century, a new process was developed in which freshly calcined shale (normally colliery waste) was treated with hot concentrated sulphuric acid. These works were sited on or near the coal fields, and rapidly made the older Yorkshire technology redundant, the last works in the North York Moors area closing in 1871.
- 1.3.7 The Carlton Bank alum works is recorded as having operated from c1680 to 1774, though the earliest record of its form is the mid-nineteenth century 1st edition Ordnance Survey (OS) map. This indicates the quarry which forms the present evaluation area, and an alum house c1 km to the north-west, at the base of the slope.

1.4 PREVIOUS WORK

- 1.4.1 A field evaluation was undertaken by the Lancaster University Archaeological Unit (LUAU 1996), which comprised a topographical survey to record the suite

of relatively small-scale features not recorded by a contour survey, undertaken on behalf of the NYMNP, and a programme of trial trenching to test a sample of the features identified. Whilst many of these proved to be relatively recent, some, more deeply buried, were associated with the alum works.

- 1.4.2 A further phase of work (LUAU 1997) comprised a sample geophysical survey, the detailed recording of a section of both bank and spoil tip revealed in an erosion scar, palaeoenvironmental investigation of a waterlogged deposit at the base of the slope, and sample geochemical analysis. This programme revealed potential other subsurface features immediately above the edge of the spoil tip, and that also the tip had been carefully engineered, with the spoil deposited in horizontal layers, rather than being tipped over the edge of the slope in a more casual fashion.

1.5 CIRCUMSTANCES OF PROJECT

- 1.5.1 A land reclamation scheme has been put forward, to stabilise the present slope by the removal of the calcined shale tip from the hillside. This material will be removed from the site and the slope graded to a stable angle of repose. This will necessarily remove the entirety of the spoil tips and also disturb some of the features associated with alum working immediately beyond. A scheme for ensuring that the slope remains well-drained will also be enacted, which will also affect some of the culverts identified in the topographic survey, which are probably associated with launders leading the alum liquor down to the alum house at the base of the slope. Therefore a mitigation policy for recording deposits in advance of and during the reclamation works has been requested by the NYMNP Archaeologist. This involves a programme of detailed surface survey, mitigation excavation and a watching brief during the reclamation programme.

2. METHODOLOGY

2.1 SURVEY METHODOLOGY

- 2.1.1 An LUAU Level 3 survey was undertaken of the main processing area of the Alum Works. This level of purely interpretative survey; involves very detailed hachure draughting of surface features and is intended for output at scales of up to 1:50.
- 2.1.2 The control for the survey was established by closed traverse using a total station and was able to maintain an internal control accuracy of better than +/- 0.05m. The primary control points were subsequently located with respect to existing survey control.
- 2.1.3 The archaeological detail and significant topographic features were surveyed using a Zeiss ELTA 3 total station and data-logger. This digital survey data was transferred, via DXF file format, into a CAD system. The archaeological detail was drawn up in the field with respect to field plots of the survey data and these edits were then transferred onto the raw survey data within the CAD system. The archaeological digital data was subsequently superimposed onto base digital topographic data supplied by NYMNP.

3. SUMMARY SURVEY RESULTS

3.1 INTRODUCTION

- 3.1.1 The survey revealed several small spoil tips, three trackways, three areas of stonework (Sites 1, 3 and 4), a dam (Site 5) and a large hollow (Site 2).

3.2 RESULTS

- 3.2.1 **Site 1:** a deep erosion gully on the south-western side of the spoil tip contained large amounts of dressed stone up to 0.8m x 0.4m x 0.25m in size. There were also occasional fragments of worked timber, many of which were at oblique orientations with respect to the line of the gully and did not appear to be *in situ*. However, there were also at least two upright vertical timbers aligned down the line of the gully. The stones and timbers did not display any consistent pattern and all appeared not to be *in situ*, presumably carried down the gully by water flow from the processing area at the top.
- 3.2.2 The subsequent excavation programme, coupled with aerial photographic and oral evidence, indicates that the line of the gully post-dates the alum working, and is entirely formed as a result of water erosion. The excavation also demonstrated that the gully has cut through at least one steeping tank and it would appear that the stone and timber scattered within the gully are the remains of the walls and floor of the disturbed section of tank.
- 3.2.3 **Site 2:** a large hollow was observed, which comprised outer banks c16m in diameter; the banks survived to a height of c0.3m and the central hollow was c8m in diameter and 0.4m deep. Although this feature appears to have been cut into the area immediately to the east of the main spoil heap it does not conform, in its morphology, to any features normally associated with the workings. The subsequent mitigation excavation identified a circular, stone raw liquor cistern at a depth of c1.2m directly beneath this hollowed earthwork. The earthwork was clearly a much later feature, but the coincidence of their almost identical centre points would suggest that they were related; the earthwork may be a product of subsidence of the cistern. The hollow feature was fully recorded to act as mitigation prior to its destruction.
- 3.2.3 **Sites 3:** Site 3 was an area of stonework on the north side of a stream gully; it comprises six stones, in two north/south aligned rows (each c 1m long) which are c0.5m apart. There is also a suggestion of a perpendicular return towards the south. This would appear to be the remains of a wall and corner of a largely decayed structure, which has been exposed by the erosion of the overlying spoil heaps by the channelling of water under the main track way. However, without further excavation it was not possible to establish the function of the structure.
- 3.2.4 **Site 4:** an area of stonework, identified during the evaluation (LUAU 1996: Trench G), had been further eroded to reveal a north-east/south-west aligned stone built 'culvert' (Site 4). This was 1.2m wide and exposed for a length of

2.2m; it survived in reasonable condition to a height of 0.4m, above the present ground surface. It was not evident from the surface evidence if this was the remains of a culvert or a bridge; however, the area to the south-west was subsequently exposed during the mitigation excavation and confirmed that it was in fact a bridge over a water channel.

- 3.2.5 **Site 5:** the gully passing through the Site 3 structure led into the water channel flowing to the north from Site 4. Immediately north of their confluence the channel spread into a 'V'-shaped reservoir which was 10m wide at its north-western end where it was edged by an earthen dam (c1.5m high) (Site 5). This reservoir has become completely silted up so it was not possible to determine its original depth. The area to the north of the dam was boggy and extended outside the study area.
- 3.2.6 **Other Features:** three trackways were also recorded during the survey. The main north/south trackway bordered the site to the east, and a track leading from this bounded the site to the south. Immediately to the west of this junction is an ephemeral track in a shallow linear hollow (c0.1m deep), which is aligned north/south onto the spoil heap. This probably represents the main route for dumping material onto the spoil heap.
- 3.2.7 The survey also highlighted the boundary of the spoil heap. A break of slope c0.3m high was observed along the eastern edge of the spoil heap down onto the hillside, a boundary also marked by a colour change from pinkish calcined shale to a grey shale.

4. DISCUSSION

- 4.1 The topographic survey provided an invaluable mitigation record of the sites surface features prior to the stabilisation of the spoil heaps, although this work was hampered by waterborne accumulations of debris which have obscured elements of the site. The survey has demonstrated the severity of the damage that has been caused to the archaeological remains by the continuing erosion of the site (Site 1).
- 4.2 The results of the survey did not identify the features of the processing area but did demonstrate that there were localised elements of the industry surviving on the surface. The existence of Site 2, mirroring a deeply stratified structure, suggests that other surface features may highlight deep sub-terranean structures. Whilst subsequent excavation have demonstrated that most of the surface features are stratigraphically much higher than the core archaeology, there are, however, spoil heaps and localised exposures of water management features which are of archaeological significance (Sites 3, 4 and 5).

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ILLUSTRATIONS

Figure 1: Carlton Bank Site Location Map

Figure 2: Topographic survey

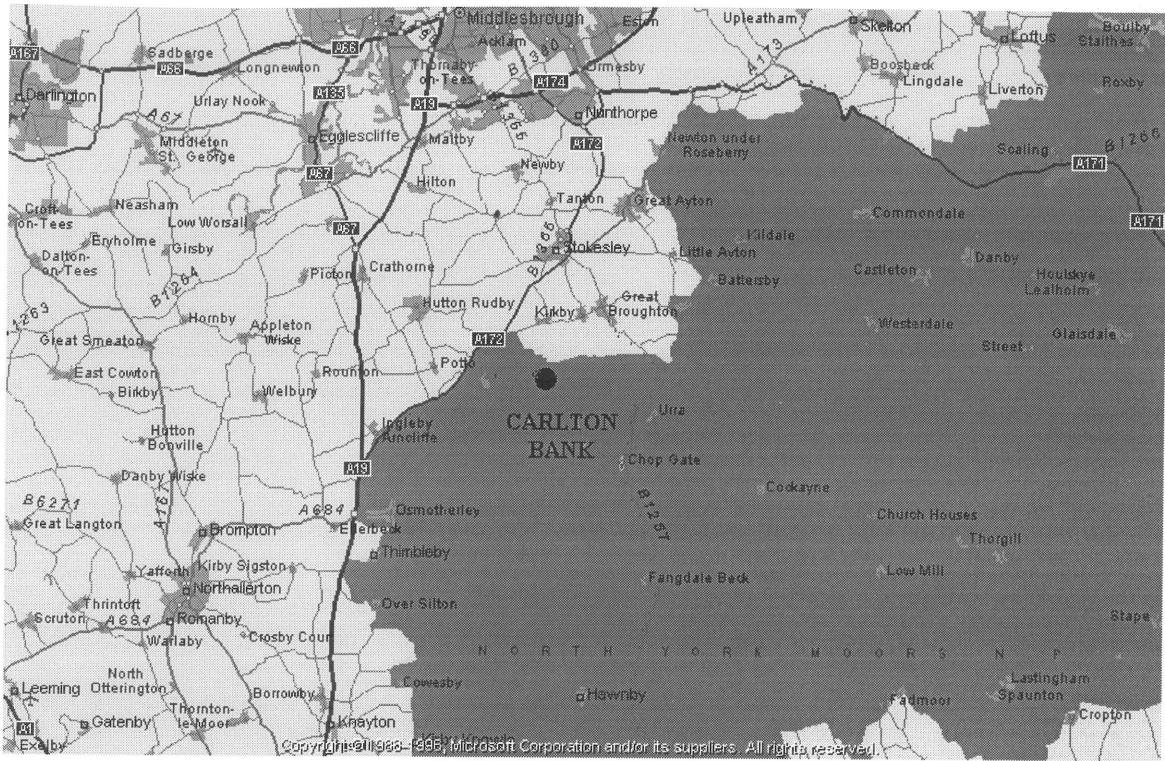


Fig 1 Carlton Bank Location Map

CARLTON BANK
ARCHAEOLOGICAL
SURVEY

DRAWING NAME
TOPOGRAPHIC SURVEY

LOCATION

COMMISSIONED & FUNDED BY:

NORTH YORK MOORS
NATIONAL PARK AUTHORITY



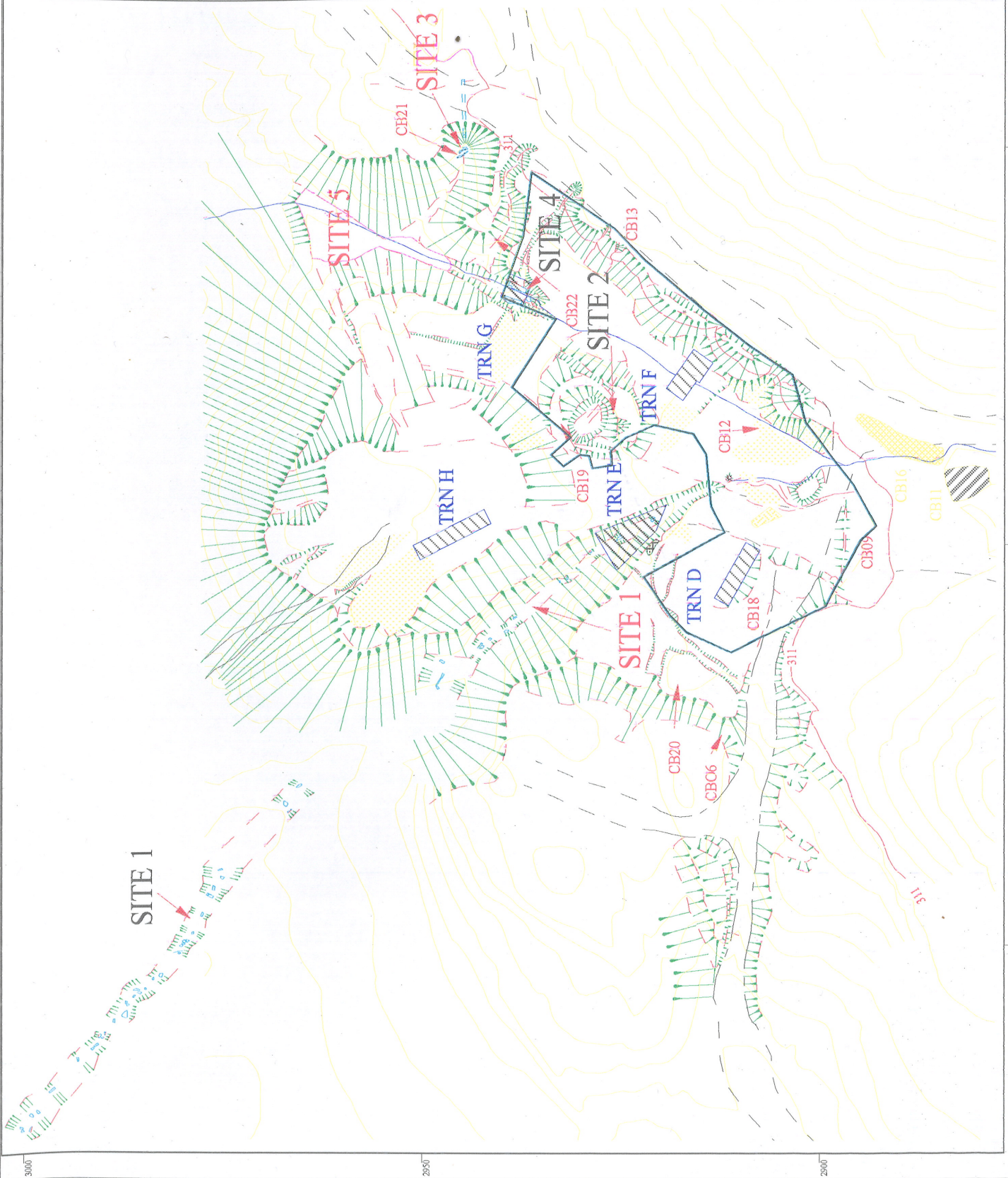
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KEY

- TRACKWAYS
- COLLECTED
ARTIFACTS
- SPOIL HEAP
- TALL HERB

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